

What is claimed:

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1. An isolated avian gonadal cell comprising a heterologous nucleic acid.

2. The gonadal cell of claim 1, wherein said cell is an embryonic cell.

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3. The gonadal cell of claim 1, wherein said cell is a gonadal primordial germ cell.

4. The gonadal cell of claim 1, wherein said cell is an ovarian cell.

5. The gonadal cell of claim 1, wherein said cell is a testes cell.

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6. A method of introducing a nucleic acid molecule into the genome of an avian species, comprising contacting a population of isolated gonadal cells obtained from a chick embryo with said nucleic acid molecule to yield transfected gonadal cells, and transferring said transfected gonadal cells to a fertilized recipient avian egg.

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7. The method of claim 6, wherein said population comprises at least 0.5% primordial germ cells.

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8. The method of claim 6, wherein said population comprises at least 1% primordial germ cells.

9. The method of claim 6, wherein said population comprises at least 50% primordial germ cells.

10. The method of claim 6, wherein said population comprises at least 90% primordial germ cells.

5 11. The method of claim 6, wherein said chick embryo is at an embryonic stage of greater than 27.

12. The method of claim 6, wherein said chick embryo is at an embryonic stage of 29-36 of gestation.

10 13. The method of claim 6, wherein said transfected gonadal cells and said fertilized avian egg are derived from the same species.

15 14. The method of claim 6, wherein said transfected gonadal cells and said fertilized avian egg are derived from different species.

15. The method of claim 6, wherein said fertilized avian egg is between stage 7-8.

20 16. The method of claim 6, wherein said fertilized avian egg is between stage 13-19.

17. The method of claim 6, wherein the breed of said chick embryo is White Leghorn.

25 18. The method of claim 6, wherein the breed of said chick embryo and the breed of said fertilized recipient egg are different.

19. The method of claim 6, wherein said fertilized avian egg is partially sterilized prior to transferring said transfected gonadal cells.

20. The method of claim 6, wherein said fertilized avian egg is contacted with busulfan prior to transferring said transfected gonadal cells.

5 21. The method of claim 6, wherein said transfected gonadal cells are transferred directly into the germinal crest of said fertilized recipient avian egg.

22. The method of claim 6, wherein the sex of said gonadal cells and the sex of an embryo in said fertilized recipient avian egg is the same.

10 23. An isolated avian gonadal cell, comprising a genetic disruption of an endogenous gene, wherein said disruption inhibits production of a functional gene product.

15 24. An avian egg comprising a xenogeneic primordial germ cell.

20 25. An avian egg comprising the cell of claim 1.